

WHAT IS CLAIMED IS:

1. A mechanical assembly, comprising:

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an arm connected to and free to rotate about a pivot point;

a counterbalance extension link connected to and free to rotate about the pivot point;

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a yoke including a first slot in which a pin of the counterbalance extension link resides, wherein the yoke is enabled to translate in a plane responsive to rotation of the counterbalance extension link pin about the pivot point; and

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a force generating device connected between the counterbalance extension link pin and a fixed point on the yoke to exert a force on the counterbalance extension link pin, wherein the orientation of the force produced by the force generating device remains constant as the yoke translates responsive to the counterbalance extension link pin rotating about the pivot point.

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2. The assembly of claim 1, wherein the counterbalance extension link and the arm are collinear and the orientation of the first slot is parallel to the force of gravity.

3. The assembly of claim 2, wherein the yoke includes at least a second slot perpendicular to the first slot and a pin attached to a fixed reference through the second slot to guide the motion of the yoke as it translates.

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4. The assembly of claim 1, wherein the counterbalance extension link and the arm are perpendicular; and the orientation of the first slot is perpendicular to the force of gravity.

5. The assembly of claim 4, wherein the yoke includes at least a second slot perpendicular to the first slot and a pin attached to a fixed reference through the second slot to guide the motion of the yoke as it translates.

5 6. The assembly of claim 1, wherein the force generating device is a constant force spring.

7. The assembly of claim 1, further comprising a second arm connected to and free to rotate about a second pivot point wherein the second pivot point is located on the first arm, a second counterbalance extension link connected to and free to rotate about the second pivot point, a
10 second yoke enabled to translate in a plane responsive to rotation of the second extension link pin and a second force generating device to exert a counterbalancing force on the second link pin.

8. The assembly of claim 7, wherein the first and second force generating devices are provided
15 by a single spring.

9. A balanced mechanical assembly, comprising:

20 a mechanical arm connected to and free to rotate about a pivot point;

an extension link connected to and free to rotate about the pivot point;

25 a yoke configured to translate back and forth in a first direction, wherein the yoke position in the first direction tracks the first direction position of a free end of the extension link rotates about the link pin; and

30 a force generating device affixed to the yoke and configured to exert a force on the free end of the extension link, wherein the exerted force generates a movement about the pivot point substantially equal in magnitude and opposite in direction from the movement about the pivot point generated by the arm.

10. The assembly of claim 9, wherein the extension link and the arm are collinear and the orientation of the first direction is perpendicular to the force of gravity.

5 11. The assembly of claim 10, wherein the yoke includes a first slot perpendicular to the first direction, wherein a link pin attached to the free end of the extension link engages the first slot and moves within the first slot as the link pin rotates about the pivot point.

12. The assembly of claim 9, wherein the counterbalance extension link and the arm are perpendicular; and the orientation of the first direction is parallel to the force of gravity.

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13. The assembly of claim 12, wherein the yoke includes at least a first slot perpendicular to the first direction, wherein a link pin attached to the free end of the extension link engages the first slot and moves within the first slot as the link pin rotates about the pivot point.

15 14. The assembly of claim 9, wherein the force exerted by the force generating device is constant and independent of the position of the extension link.

15. The assembly of claim 14, wherein the force generating device is a constant force spring.

20 16. The assembly of claim 9, further comprising a second arm connected to and free to rotate about a second pivot point wherein the second pivot point is located on the first arm, a second extension link connected to and free to rotate about the second pivot point, a second yoke enabled to translate back and forth in a single direction to track the single direction position of a free end of the extension link, and a second force generating device to exert a counterbalancing
25 force to the free end of the second extension link.

17. The assembly of claim 16, wherein the first and second force generating devices are provided by a single spring.

18. A mechanical assembly, comprising:

a mechanical arm connected to and free to rotate about a pivot point;

5 a extension link connected to and free to rotate about the pivot point, wherein the angle formed by the mechanical arm and the extension link is fixed;

means for applying a force to a free end of the extension link, wherein the exerted force remains substantially constant in magnitude and direction as the arm and extension link
10 rotate about the pivot point, wherein the applied force generates a movement about the pivot point that is substantially equal in magnitude and opposite in direction to a movement generated by the mechanical arm.

19. The assembly of claim 18, wherein the force application device includes a constant force
15 device connected to a free end of the extension link.

20. The assembly of claim 19, wherein the constant force device is further connected to a point on a yoke configured to translate in a first direction as the extension link rotates, wherein the position in the first direction of the yoke tracks the first direction position of the free end of the
20 extension link.